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AUTHOR	Cummings, Frank E.
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ABSTRACT

Recently published data concerning freshmen preference, undergraduate and graduate enrollments, and degrees awarded to blacks in science and engineering have been compiled in an effort to determine areas where emphasis might be placed to increase the number of black scientists and engineers. The results indicate that traditionally black colleges continue to enroll a sizeable portion of black undergraduates. An increase in interest in engineering at both black colleges and other institutions is noted. Differences in drawing power of various science and engineering fields by type of institution are also examined. Degrees awarded to black students are tabulated by field, year, institutional type, and degree level. It is noted that black degree recipients as a percent of degree recipients at all levels demonstrate a significant decline in numbers moving from the bachelor's to doctoral level. It is suggested that vigorous recruiting efforts in high schools and community colleges as well as counseling at all levels may increase black enrollment in science and engineering programs. (SF)

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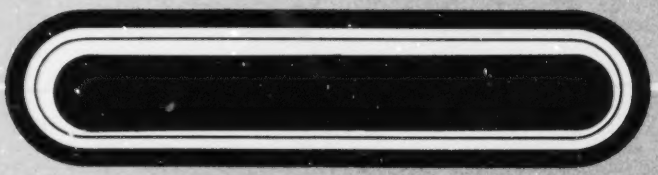

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RESOURCE CENTER FOR SCIENCE & ENGINEERING

DEGREES, ENROLLMENT AND FIELD PREFERENCE FOR BLACK STUDENTS IN THE SCIENCE AND ENGINEERING FIELDS: RECENT DATA

RCSE Report

NUMBER 1

by

Frank E. Cummings, Ph.D.

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Introduction

This paper considers recent published data on freshman preference, undergraduate and graduate enrollments, and degrees awarded to blacks at the undergraduate and graduate levels in science and engineering. The data suggest a number of areas where emphasis might be placed in the on-going effort to increase the number of black scientists and engineers.

The data, from a variety of sources, are of varying quality but generally self-consistent. Special effort was taken to point out the data based on small samples.

Black Undergraduate Enrollment, General

In the Fall of 1976, black undergraduate enrollment -- full- and part-time -- had risen to 886,315 students of whom 33.3% were in 2- or 4-year institutions which were majority black, 49 and 99 institutions respectively. Some 36.2% were spread out over 1610 other 4-year institutions and 32.7% over 1094 other 2-year institutions. In the 14 Southern Regional Education Board (SREB) states and the District of Columbia, 47.1% of black undergraduates were in majority black institutions.

These data, as presented in detail in Table 1, reveal three important points. Majority black colleges, whether in the historically black group or among the newer urban group in the north, continue to enroll a concentrated and sizeable fraction of black undergraduates. Black enrollment in the five northern states with major urban black populations is highly concentrated in 2-year colleges -- 59.4% -- largely in a small number of identifiable institutions. This relatively small group of urban 2-year colleges should be actively considered as potential sources of students by the majority black 4-year colleges. Throughout the nation, community colleges play a disproportionately large role in minority higher education. How effective these institutions are in encouraging the development of minority scientists is a largely unstudied but increasingly crucial question.

Black enrollment in majority institutions sharply increased beginning in the fall of 1967. There is some evidence, however, that this trend has peaked. Table 2 presents black enrollment data for the University of California, California State University, and Community College systems for the period 1968-1976. A diminishing trend is clearly evident at the undergraduate and graduate level in the University system starting in 1973. The current trends in State University and Community College systems are mixed. These two systems do have percent black undergraduate enrollments at near parity with the percent enrollment of blacks in the 12th grade. These data for California suggest an approach to steady state in black enrollment trends.

Freshman Preference for Science & Engineering Fields

As black undergraduate enrollments approach steady state, the question of student choice for science and engineering (S & E) fields becomes the major question relative to the problem of increasing the pool of minority scientists and engineers. We begin a look at this question of field allocation by looking at indicated freshman preference for various broad S & E fields over a five-year time span. The data is presented in Tables 3 and 4, as drawn from annual surveys of the Cooperative Institutional Research Program headed by Alexander Astin. The data of interest here is based on a 14 - 26% sampling of first-time, full-time freshman at historically black colleges. It should be remarked that a 1% figure in the table translates to an original sample size of only approximately 50 students in Table 4 and 90 students in Table 3.

Freshman preference for S & E fields at historically black colleges is compared to the total national sample in Table 3 over the period 1973-77. Two time trends stand out -- the parallel increase in interest in engineering at both black colleges and all institutions and the decline in interest in non-computer mathematics. The engineering figures are encouraging in suggesting that field allocation can change rapidly over relatively short periods of time. Less encouraging is that despite the major information and recruiting efforts among black high school students for engineering fields, the plots of freshman

preference for blacks and whites remain parallel rather than converging.

Of major interest in Table 3 is the degree to which S & E fields are less attractive to black freshmen than to freshmen as a whole. One frequent explanation of this is the relatively weak math background many black students have experienced. The parity between black and all figures for math preference for several years, if real, may be somewhat surprising in light of this explanation. Efforts directed toward increasing the number of secondary school students interested in science and engineering is indicated as a high priority.

It is well documented that particular types of institutions, such as research universities, draw students interested in the S & E fields at much higher rates than other types of institutions such as public 4-year colleges. Table 4 looks at this phenomena among the historically black institutions, again using freshman preference. Of some interest is the very rapid change in engineering preference in private black colleges suggesting dual degree programs have had a major impact at this type of institution in particular.

The National Center for Educational Statistics conducts a biennial survey (part of the HEGIS annual survey) which provides data on field allocation of declared majors for the major minority groups. Data for full-time black undergraduate students for Fall 1974 and 1976 are given in Table 5 for all institutions. The difference in drawing power of the various S & E fields as well as the difference in field allocation between the black and white groups is evident. The table shows also the small number of black students in these fields. This is somewhat misleading as a large pool of students declare no major in these surveys.

Black Bachelor's Degrees

The HEGIS survey for 1975-76 provided the first total counting of bachelor's degrees awarded to minorities by broad S & E fields. Table 6 presents total number of degrees awarded to blacks, including resident aliens but not non-resident aliens, as well as two measures of field allocation. In 1975-76, there

were 1917 4-year, or higher, institutions. In this light, the data on total number of degrees awarded to blacks is stark as it represents an average of less than one degree per institution per field. The table shows that field allocation of the bachelors degrees was not significantly different for black students at black institutions as compared to black students at all institutions.

Degrees awarded to blacks at black and at white institutions are compared in Table 7 for 1973-74 and 1975-76. As the data for 1973-74 were based on a sample only, comparison of the data for the two periods must be made only with caution. Hopefully, the slight decline in S & E bachelor degrees awarded at black institutions is an artifact of the 1973-74 sampling. There does appear to be a genuine increase in S & E degrees awarded to blacks at white institutions as one would expect from the California enrollment data in Table 2.

Table 8 presents data from various sources for the fields of chemistry and physics and for the United Negro College Fund (UNCF) institutions, again to emphasize the very small pool size.

How does freshman preference relate to field allocation of bachelor's degrees and how important is attrition? Astin's data and data from the annual UNCF survey provide a qualitative answer to these questions for the private historically black institutions. These data are compared in Table 9. The first two data columns suggest considerable attrition between initial freshman interest and the final awarding of degree. However, with the exception of engineering, the field allocation of the two measures remains much the same. This may indicate a general attrition problem rather than large-scale field switching. Comparison of the last two columns indicates private black colleges do substantially better than the average, except in engineering, in terms of the percent of their bachelor's degrees awarded in the sciences.

A number of UNCF institutions appear to have a relatively high science orientation as reflected in number of degrees awarded or percent of degrees awarded in the S & E fields. Of interest is that the student characteristics vary a great deal among these institutions. To the extent a college chooses to emphasize science, these institutions may provide valuable resources. The institutions are listed in Table 10.

Black Graduate Enrollment and Degrees

The number of master's degrees awarded to blacks in the S & E fields are presented in Table 11. Much the same deficit pattern appears here as regards field allocation, as appeared at the undergraduate level. The dominance of education is clearly apparent.

Similar data is presented for doctoral degrees in the S & E fields in Table 12 for the period 1973-77. In reviewing the data in this table, it is instructive to keep in mind that freshmen entering college in the Fall of 1967 would only begin receiving Ph.D.'s around 1976. On that basis alone, a continued rise in annual production of Ph.D.'s might be expected. The University of California data in Table 2 and comparison of the first and last data columns in Table 12 suggest this may not be the case, however, in most S & E fields. When it is realized there are some 150 to 300 doctoral departments, depending on the field, the figures in Table 12 are discouraging.

Graduate enrollment in the S & E fields for Fall 1974 and Fall 1976 is presented in Table 13. The change in enrollment between the two years is between 5 and 10%.

Black degree recipients as a percent of all degree recipients at the three degree levels are collected in Table 14 to demonstrate the worsening situation moving from the bachelor's to the doctoral level.

One major factor for this situation is illustrated in Table 14 which focuses on the fate of B.S. recipients who later obtain a doctoral degree. What is evident for baccalaureates in both the physical and biological sciences is a major leakage into education. As the black B.S. recipients have already shown an interest in science and a determination to obtain a doctoral degree, this leakage is of some concern. Counseling efforts among undergraduate majors might be of some importance in this situation.

Conclusion

One consistent finding throughout this study is the question of field allocation. The freshman preference data suggest field allocation can change

significantly and rapidly over short periods of time. Recruitment in high schools and community colleges, coupled with counseling at all levels, are relatively low-cost efforts which may show significant results for a college interested in increasing its S & E enrollments and degrees.

Table 1. Distribution of Black Undergraduate Full- Plus Part-Time Enrollment by Institutional Type in Selected States, Fall 1976.

Area	Full- + Part-Time Black Undergraduate Enrollment	Percent of Black Undergraduate Enrollment			
		Black[1] 4-yr	Other 4-yr	Black[1] 2-yr	Other 2-yr
AL	29,190	47.4	22.2	10.0	20.4
AK	9,310	37.1	47.3	2.0	13.5
FL	34,665	19.5	17.6	0.0	62.9
GA	25,530	48.8	28.7	4.3	18.2
LA	32,167	52.8	32.2	3.0	12.0
KY	8,710	14.7	55.1	0.0	30.2
MD	31,328	26.8	22.4	26.1	24.7
MS	24,245	52.0	13.9	13.6	20.5
NC	42,449	45.8	12.5	1.9	39.8
SC	22,290	35.4	17.8	8.8	37.9
TN	22,715	35.0	35.7	14.7	14.5
TX	54,093	27.1	29.7	0.6	42.7
VA	25,834	57.2	16.1	0.9	25.8
WV	3,025	0.0	85.3	0.0	14.7
DC	19,118	90.1	9.8	0.0	0.1
SREB + DC	385,669	41.0	23.9	6.1	29.0
CA	117,613	0.0	22.3	8.9	68.9
IL	63,418	6.3	36.0	43.6	14.1
MI	43,852	4.5	45.6	27.1	22.7
NY + NJ	97,480	4.1	53.3	21.3	21.3
Other	178,283	4.8	56.6	9.9	28.7
Nation	886,315	20.4	36.2	12.9	32.7
N[2]	2,852	99	1610	49	1094

[1] Institutions with 50% or more black undergraduate enrollment.

[2] N = number of institutions in given category in the nation.

Table 2. Percent of Total Enrollment That is Black in Three California Systems[1]

	University of California		California State University		Community Colleges
	Undergrad.	Grad.	Undergrad.	Grad.	Undergrad.
1968	2.2	1.9			
1969	2.9	3.0			
1970	3.6	4.0			
1971	4.5	5.2			
1972	5.1	5.7			
1973	4.9	5.5	6.5	4.7	8.4
1974	4.5	5.0	6.3	6.7	8.4
1975	4.1	4.7	6.7	4.9	7.6
1976	4.0	3.9	6.9	5.0	---

[1] In California in 1973, Blacks represented: 10.4% of 3rd grade population
9.8% of 6th grade population
9.4% of 9th grade population
7.9% of 12th grade population
7.0% of total population (in 1970).

Table 3. Freshman Preference for Science & Engineering at Black and All Institutions, Fall 1973 - 1977.[1]

Field	Percent of Freshmen Preferring Field									
	1973		1974		1975		1976		1977	
	Black[2]	All[3]	Black	All	Black	All	Black	All	Black	All
Biological	5.1	7.0	5.0	6.7	3.7	6.3	5.7	6.2	3.9	4.7
Enginnering	3.9	6.6	5.1	6.6	4.6	7.9	5.8	8.5	5.8	9.3
Mathematics/ Statistics	1.7	1.7	1.3	1.4	0.5	1.1	0.6	1.0	0.9	0.8
Physical	1.6	2.7	2.1	2.6	1.6	2.7	1.8	2.7	1.1	2.3
Chemistry	1.1[4]	1.7[4]							0.6	0.9
Physics									0.3	0.4
Computer Science									0.9	1.0

[1] Cooperative Institutional Research Program, The American Freshman.

[2] Black = First-time full-time freshmen at historically black institutions.

[3] All = All first-time, full-time freshmen at all institutions.

[4] Chemistry and Physics co[illegible]ed.

Table 4. Freshman Preference for Science & Engineering Fields at Black Institutions by Institutional Control, Fall 1973 - 1977.[1]

Field	Percent of Freshmen Preferring Field									
	1973		1974		1975		1976		1977	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Biological	3.7	7.6	4.1	6.9	2.6	5.4	2.8	11.2	3.0	5.9
Engineering	5.2	1.4	6.3	2.4	5.8	2.9	5.1	7.1	5.9	5.4
Mathematics/ Statistics	1.3	2.6	1.0	2.0	0.3	0.7	0.7	0.6	1.0	0.7
Physical	1.6	1.8	1.6	3.2	1.3	2.2	1.3	2.7	0.8	1.6
Chemistry	0.9[2]	1.6[2]							0.3	1.3
Physics									0.4	0.1
Computer Science									1.0	0.6

[1] Cooperative Institutional Research Program, The American Freshman. First-time, full-time freshmen only.

[2] Chemistry and Physics combined.

Table 5. Declared Major Field of Full-Time Black Undergraduates, Fall 1974 and 1976.[1]

Field	1974				1976			
	Number of Blacks	Black as % Total[2]	Black Field %[3]	White Field %	Number of Blacks	Black as % Total	Black Field %	White Field %
Biological	13,528	6.00	2.66	4.14	16,929	7.24	2.80	4.08
Engineering	10,287	5.10	2.02	4.14	15,677	5.07	2.59	5.22
Mathematical	4,743	7.86	0.93	1.24				
Physical	3,875	4.32	0.76	1.84	4,916	4.71	0.81	1.90
All Fields	507,884	9.01	100.00	100.00	605,116	10.20	100.00	100.00

[1] HEGIS. Includes resident aliens.

[2] Percent of all students declaring given field as a major who are black.

[3] Percent of all black students who declare a given field as their major.

Table 6. Black Bachelor's Degrees in Science & Engineering, 1975 - 1976.[1]

Field	# of Black	Black as % Total	Black Field %	White Field %	Black Field % at Black Institutions
Biological	2,332	4.78	3.93	5.98	4.43
Engineering	1,379	2.96	2.32	4.86	2.06
Mathematical	803	5.01	1.35	1.74	1.67
Computer Science	323	5.73	0.54	0.60	0.51
Physical	658	3.04	1.11	2.41	1.16
All Fields	59,297	6.37	100.00	100.00	100.00

[1] HEGIS. Includes resident aliens. As reported in Pingle.

Table 7. Black Bachelor's Degrees in Science & Engineering by Institutional Type, 1973-74 and 1975-76.

Field	1973 - 74[1]			1975 - 76[2]		
	All Institutions	Black Institutions	White Institutions	All Institutions	Black Institutions	White Institutions
Biological	1,928	1,053	875	2,332	1,044	1,288
Engineering	1,094	398	696	1,379	486	893
Mathematical	1,146	632	514	1,126	515	611
Mathematics				803	394	409
Computer Science				323	121	202
Physical	729	351	378	658	273	385
Science Sub-Total	4,897	2,434	2,463	5,495	2,318	3,177
All Fields	52,100	23,400	28,700	59,297	23,581	35,716

[1] American Council on Education, Higher Education Panel. Prorated sample of 539 of 1704 institutions. Includes resident aliens.

[2] HEGIS survey of all institutions. Includes permanent aliens. As reported in Mingle.

Table 8. Selected Data on Black Bachelor's Degrees in Science & Engineering, 1974-75 through 1976-77.

Field	1974 - 75			1975 - 76			1976 - 77		
	All Institutions	ACS[1]	UNCF[2]	All Institutions	ACS	UNCF	All Institutions	ACS	UNCF
Biological			433						416
Engineering			57						53
Mathematical			157						124
Physical			123						
Chemistry		114			104			112	107
Physics[3]	105			86			91		16
All Fields			6,869						6,059

[1] Fifteen historically black institutions with American Chemical Society accredited chemistry programs. Includes all graduates.

[2] United Negro College Fund institutions. Includes all graduates.

[3] American Institute of Physics. Includes aliens.

Table 9. Comparison of Field Allocation of Black Freshman Preference and Bachelor's Degrees at UNCF Institutions.

Field	Freshmen, Private 1973 (N)	UNCF Bachelor's 1976-77 (N)	Black Bachelor's All Institutions 1975-76
Biological	7.6 (1040)	6.9 (416)	3.9
Engineering	1.4 (192)	0.9 (53)	2.3
Mathematical	2.6 (360)	2.0 (124)	1.4
Physical	1.8 (250)	2.0 (123)	1.1
Total	(13,684)	(6869)	

Table 10. UNCF Institutions with a Total of 50 or Greater Science & Engineering Bachelor's Degrees Awarded and/or an Average of Twenty Percent or Greater of its Bachelor's Degrees Awarded in Science & Enginering for the Two Years, 1974-75 and 1976-77.

Institution	Combined Total Science & Eng. Bachelor's for 1974-75 & 1976-77	Total Science & Eng. Degrees as % of Total Degrees for 1974-75 & 1976-77
Claflin College	67	22.8
Fisk University*	144	27.1
Morehouse College	67	18.0
Paine College	37	23.9
Rust College	46	21.3
Spelman College	51	11.6
Talladega College	37	20.0
Tougaloo College	68	22.8
Tuskegee Institute*	187	19.0
Virginia Union	50	12.1
Voorhees College	50	15.3

* Includes master's degrees.

Table 11. Black Master's Degrees in Science & Engineering, 1975-76.[1]

Field	# of Blacks	# Awarded at White Institutions	# Awarded at Black Institutions	Black as % of Total	Black Field %	White Field %
Biological	215	148	67	3.25	1.06	2.19
Engineering	233	224	9	1.46	1.14	4.34
Physical	137	97	40	2.53	0.67	1.68
(Physics)[2]	(21)[2]					
Mathematical	130	105	25	3.37	0.64	1.24
Computer Science	60	55	5	2.37	0.29	0.78
Education	12,440	8,604	3,836	9.69	61.10	41.70
All Fields	20,351	15,380	4,971	6.24	100.00	100.00

[1] HEGIS, includes permanent resident aliens. As reported in Mingle.

[2] American Institute of Physics: 1974-75, 30; 1975-76, 21; 1976-77, 17. Includes all aliens.

Table 12. Black Ph.D. Degrees in Science & Engineering, 1973 - 1977.

Field	1973-1976[1]				1974-75	1975-76[2]	1976-77[3]
	# of Blacks	Blacks as % Total	Black Field %	White Field #			
Biological	171 (14)	1.58	4.98	10.38		52	35
Biochemistry	28 (2)	1.43					
Engineering	55 (20)	0.78	1.60	6.75		19	15
Chemistry	81 (5)	1.48	2.36	5.35			22
Physics	24 (3)	0.60	0.70	3.81	16[4]	8[4]	20[4]
Earth Sciences & Environmental	7 (1)	0.33	0.20	2.09			2
Mathematical & Computing	37 (3)	1.08	1.08	3.31		9	10
All Fields	3,495 (197)	3.29	100.00	100.00		1,213	1,186

[1] Includes only U.S. citizens in each category of Black, White, Total. Excludes resident and non-resident aliens. Resident aliens in parenthesis. National Research Council.

[2] HEGIS, includes permanent-resident aliens.

[3] National Research Council, includes permanent-resident aliens.

[4] American Institute of Physics data. Includes aliens.

Table 13. Black Graduate Enrollment[1] in Fall 1974 and 1976 in Science & Engineering Fields.

Field	1974 Total	1974 Field %[2]	1974 Full-Time	1974 Field %[2]	1976 Total	1976 Field %[2]	1976 Full-Time	1976 Field %[2]
Biological	1,046	1.60	577	2.6	1,125	1.70	607	2.8
Physical	600	0.92	216	1.4	632	0.97	345	1.6
Chemistry	438[3]							
Physics[4]	>122		>107		>75		>60	
Others	38[3]							
Engineering	809	1.20	341	1.5	824	1.30	327	1.5
Mathematical	579	0.89	229	1.0				
All Fields	65,033	100.00	22,092	100.0	65,345	100.00	22,058	100.0

[1] Includes Master's and Doctoral students. HEGIS.

[2] Given field enrollment as percent of black graduate enrollment in all fields.

[3] Estimated in this study.

[4] American Institute of Physics student enrollment is actual number in 71% sample return.

Table 14. Comparison of Black as Percent of Total at Various Degree Levels.

Field	B.S. Degrees 1975 - 76	M.S. Degrees 1975 - 76	Ph.D. Degrees 1973 - 77	Full-Time Graduate Enrollment - 1976
Biological	4.78	3.25	1.58	2.45
Engineering	2.96	1.46	0.78	1.67
Mathematical	5.01	3.37	1.08	--
Physical	3.04	2.53	0.94	1.71
All Fields	6.37	6.24	3.29	5.80

Table 15. Baccalaureate Field of Black (B) and White (W) Ph.D. Recipients by Doctoral Field, 1973 - 76.

Baccalaureate Field		Ph.D. Field			
		Physical Sciences (%)[1]	Biological Sciences (%)[1]	Education (%)[1]	All
Physical Sciences[2]	B	137 (39.1)	30 (8.6)	141 (40.3)	350
	W	11,098 (67.7)	1,976 (12.0)	1,314 (8.0)	16,410
Biological Sciences	B	7 (1.7)	174 (41.5)	169 (40.3)	419
	W	329 (2.8)	9,304 (80.0)	1,265 (10.9)	11,635
All Other Fields	B	3	14	1,726	
	W	1,036	1,167	18,764	

[1] Percent given number is of all doctorates having a given undergraduate field, i.e., percent of figure in final column.

[2] Physical Sciences includes Mathematics and Environmental Sciences.

Data Sources

1. Annual Report of the American Chemical Society Committee on Professional Training, 1975; 1976; 1977, American Chemical Society, Washington, D.C. As reported in Chemical and Engineering News, May 3, 1976; March 21, 1977; April 10, 1978.

2. Alexander W. Astin, et al., The American Freshman: National Norms for Fall 1977, 1976, 1975, 1974, 1973, Cooperative Institutional Research Program, American Council on Education and University of California, Los Angeles, CA.

3. Frank J. Atelsek and Irene L. Gomberg, Bachelor's Degrees Awarded to Minority Students 1973-74, Higher Education Panel Report, Number 24, American Council on Education, Washington, D.C., 1977.

4. Susanne D. Ellis, Enrollments and Degrees, American Institute of Physics Reports No. R-151.13 (1976); R-151.14 (1977); R-151.15 (1978), New York.

5. Dorothy M. Gilford and Joan Snyder, Women and Minority Ph.D.'s in the 1970's: A Data Book, Commission on Human Resources, National Research Council, Washington, D.C., 1977.

6. Dorothy M. Gilford and Peter D. Syverson, Summary Report 1977, Doctorate Recipients from United States Universities, Commission on Human Resources, National Research Council, Washington, D.C., 1978.

7. Alan H. Kirschner, UNCF Annual Statistical Report of the Member Institutions, 1976, United Negro College Fund, New York, 1977.

8. Alan H. Kirschner, UNCF Annual Statistical Report of the Member Institutions, 1978, United Negro College Fund, New York, 1978.

9. James R. Mingle, Black Enrollment in Higher Education, Southern Regional Education Board, Atlanta, GA, 1978.

10. James R. Mingle, Degree Output in the South, 1975-76; Distribution by Race, Southern Regional Education Board, Atlanta, GA, 1978.

11. Racial and Ethnic Enrollment Data from Institutions of Higher Education, Fall 1974, Office for Civil Rights, U.S. Dept. of Health, Education & Welfare, Washington, D.C., 1976.

12. Racial, Ethnic, and Sex Enrollment Data from Institutions of Higher Education, Fall 1976, Office for Civil Rights, U.S. Dept. of Health, Education & Welfare, Washington, D.C., 1978.

13. Equal Educational Opportunity in California Postsecondary Education: Part II, Commission Report 77-4, California Postsecondary Education Commission, Sacramento, CA, 1977.